

*If you are using a printed copy of this procedure, and not the on-screen version, then you **MUST** make sure the dates at the bottom of the printed copy and the on-screen version match.  
The on-screen version of the Collider-Accelerator Department Procedure is the Official Version.  
Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A.*

## C-A OPERATIONS PROCEDURES MANUAL

### ATTACHMENT

#### 12.14.a Setting Tandem Facility Perimeters - CHECKLIST

C-A-OPM Procedures in which this Attachment is used.		
12.14		

#### Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Approved: \_\_\_\_\_ ***Signature on File*** \_\_\_\_\_  
Collider-Accelerator Department Chairman Date

C. Carlson

## 12.14.a Setting Tandem Facility Perimeters - CHECKLIST

(Team Leader)\_\_\_\_\_ (Operator 2)\_\_\_\_\_

Time:\_\_\_\_\_ Date:\_\_\_\_\_

### **Note 1:**

**Interlocking Passageways, Barriers, and Perimeter Zones** [Figure 1](#) shows the location of all Radiation Station pushbutton switches and radiation areas throughout the facility. All areas or zones may be set so as to safely allow radiation in those areas. The special passageway entrances into the accelerator areas should be set first since access to the accelerator is through these passageways. Use of these passageways is rare. They are normally used only in emergency conditions.

### **Note 2:**

**Modes of Operation of the Perimeter Control** Access points are each shown as white lights on the Master Display Panel as shown in [Figure 2](#). The upper portion of the display depicts the layout of the main floor of the accelerator building. The white lights indicated by the circled "W's" show the perimeter access from the Mechanical Equipment room through the shielding door into the low energy end of MP-6 in accelerator room #1; the gate access between the MP-6 high energy area and MP-7 low energy area; the shielding door access from the control room into the low energy end of MP-7; and the double door access through the emergency exit tunnel from target room #4 into the high energy area of MP-7. In addition, shielding door access points, indicated by white lights, are shown at the entrances to each of the four target rooms. The lower portion of the display shows the layout of the basement or pit area. An illuminated white light shows the closed or secure condition of the access gate between the low and high energy ends of MP-6 in the pit area, the tunnel access from the mechanical equipment room into the high energy pit area of MP-6, the tunnel connection between the high energy end of MP-6 and the low energy end of MP-7, and the tunnel access from the electrical equipment room into the low energy end of MP-7. In order for the accelerators to make radiation, the low energy Faraday cups shall be removed in order to allow ions into the accelerators. They cannot be removed until the operator selects some mode of perimeter control. It is necessary to have different modes of perimeter control because one accelerator could be closed down and completely free for access while the other could be in operation so that access would have to be restricted by perimeter control - independent of radiation considerations. Similarly, the access conditions are different if the three-stage mode of operation is in effect. On the main control console directly in front of the master display panel, there is a series of mode selection switches as shown in Figure 4. These switches allow the operator to select MP-6 operating in two-stage mode, MP-7 operating in two-stage mode, or MP-6 and MP-7 operating in three-stage mode. Once the mode has been selected and the perimeter secured, the accelerator is ready for operation independent of whether or not it is producing radiation. The radiation control system shall be in proper operating condition (it is tested continuously) if radiation is to be produced, independent of the requirements for perimeter control.

### Prerequisites

- Two Operators to perform the sweep
- C-A-OPM-ATT 12.14.a – Setting Tandem Facility Perimeters - Checklist

## Check

- \_\_\_\_ 1.1 **MP-6 Basement Area to Mechanical Equipment Room Passageway** The entrance into the Accelerator Room by ladder from the Mechanical Equipment Room is protected by light barrier L-15 and access via the basement of the Accelerator Room is protected by light barrier L-14. Entry shall be made by the MP-6 high energy pit or basement area. The entire passageway shall be inspected including the ladder area near the Mechanical Equipment room. Press the Radiation Station ST23 pushbutton at the south end of the passageway near the ladder. When the button is pressed the red light will blink. Exit via the pit area and press the Radiation Station ST21 pushbutton located on the plumbing pipe structure at the entrance of the passageway in the MP-6 pit area. The proper activation of these switches leaves the red light associated with each pushbutton in the ON condition. Inspection of the Radiation Display Panel in the Control Room will show that the purple light has been activated. This indicates that the passageway has been properly secured.
- \_\_\_\_ 1.2 **Target Room #4 To Accelerator Room Passageway** This passageway is only used under special circumstances and is generally kept in a secure and interlocked condition. To interlock the passageway, enter via the MP-7 accelerator room door on the east wall. After walking through the passageway to the target room, check to see that the door leading to the target room #4 is closed and the door interlock activated. Press the Radiation Station ST24 pushbutton located in the passageway near the door entry into target room #4. Exit via the MP-7 accelerator door checking to see that it is properly closed and press the Radiation Station ST25 pushbutton located to the right of this door. This action then interlocks the MP-7 target room #4 passageway and sets the zone as indicated by the purple light on the Display Panel in the Control Room and by the steady illumination of the red light associated with the pushbutton ST25.
- \_\_\_\_ 1.3 **MP-6 and MP-7 Basement Passageway** This passageway does not have a physical gate but is protected by a light beam LB3. Pushbuttons ST5 or ST11 will interlock the passageway and show that the passageway is secured. ST5 is located in the high energy pit area of MP-6 while ST11 is located in the low energy pit area of MP-7.
- \_\_\_\_ 1.4 **The Gate Barriers Between MP-6 and MP-7** Both gate barriers in the fence across the accelerator room at the end of the ion source cage of MP-7 shall be closed. Depressing either station pushbutton ST26 or ST27, located on the fence near the negative ion injection cage of MP-7 will interlock this barrier.
- \_\_\_\_ 1.5 **Shielding Door Access to MP-6** The final perimeter access is the shielding door between the mechanical equipment room and the MP-6 accelerator area. The shielding door is closed by depressing and holding the close button until the door stops. The lightweight wooden door on the mechanical equipment room side of the shielding door should also be closed manually. When either the shielding door or wooden door is closed, its closed condition is automatically signaled to the perimeter control system without any further pushbutton activation.

## 2.0 Tandem Modes

- \_\_\_\_ 2.1 **MP-6 Two-Stage Mode** - Referring to [Figure 2](#), the perimeter control for two-stage operation of MP-6 is shown on the Radiation Display Panel. The perimeter is secure when the illuminated white lights indicate security of the barriers between the high energy end of MP-6 and low energy end of MP-7; the three tunnels, from the mechanical equipment room into the high energy end of MP-6, between the high energy end of MP-6 and low energy end of MP-7, and from the pit area into the electrical equipment room; and the white or amber light at the shielding door access from the mechanical

equipment room into the low energy end of MP-6. When the lights corresponding to these access points into the MP-6 accelerator area are illuminated, indicating their closure or security, MP-6 can be operated in the two-stage mode. The shielding door access into the MP-6 accelerator room from the mechanical equipment room, has a special key-access capability. This special arrangement is necessary because when MP-6 is in operation in either two-or three-stage mode, moderate radiation levels are often produced in the high energy end of the machine while the low energy end is completely free of radiation. This means that the normal access to the low energy end of the accelerator from the Control Room via the high energy end cannot be used without going through the high energy radiation area, which means shutting down the machine for access. On the other hand, if the perimeter control can be bypassed at the shielding door access in the MP-6 area, then maintenance and other types of operation can be carried out in the low energy end of MP-6 through that shielding door when the area is free of radiation. A key arrangement allows this bypassing operation to be possible and still be under operator control. The white light on the master radiation display is only activated when the shielding door is closed. A special amber light is activated when the outer lightweight door is closed and the shielding door is open. With this arrangement the lightweight wooden door can be used to maintain perimeter control rather than the heavy shielding door. Of course, if the radiation level in the room calls for complete shielding, then the shielding door shall be closed; in other words, a red radiation level in the low energy end of MP-6 does require the heavy shielding door to be closed and the white light to be on. Perimeter access, via the lightweight wooden door, can be bypassed with a key-operated switch at the MP-6 shielding door which turns on a bright flashing yellow light corresponding to the steady-on yellow light on the master display panel. The key can only be obtained from the operator for operation of the switch; the person who operates the switch can then open the lightweight wooden door and enter the low energy end of MP-6. At the same time, when he is in the low energy end of MP-6, he is responsible for any other people who enter the area with him, or come in after him. People contemplating entering the restricted area are faced with a blinking amber light and written instructions to check with the operator before entering. When the responsible person leaves the area he shall secure it, leave the lightweight door closed, and return the key to the operator. In this way the operator or other delegated responsible persons can utilize the low energy end of MP-6 for maintenance of MP-6 for test purposes with other ion sources without interfering with the basic radiation safety or the perimeter control system of the facility.

---

## 2.2

MP-7 Two-stage Mode - Referring to the radiation display diagram, [Figure 2](#), the perimeter control for two-stage operation of MP-7 is defined by the gate between the high energy end of MP-6 and low energy end of MP-7, the tunnel access gate from Target Room 4 into the high energy end of MP-7, the tunnel access gates between the two accelerators, and the tunnel from the electrical equipment room into the pit area of the low energy end of MP-7. When the white lights corresponding to these access points into the MP-7 accelerator area are illuminated, indicating their closure or security, MP-7 may be operated in the two-stage mode with free access through the Control Room entrance only. This access point is under surveillance at all times by the operators who are on duty around-the-clock whenever the machines are in operation.

---

## 2.3

Three-stage Perimeter Control Mode - When the two accelerators are operating in the three-stage mode, the perimeter is defined by the perimeters of each of the two machines two-stage mode of operation, with the exception of the gates in the fence between the two accelerators on the main floor. In three-stage mode this gate is free access in terms of perimeter control; obviously, the gate has to be activated whenever radiation conditions exist because the radiation zones and their logic are independent of the perimeter control. Basically, the three-stage mode of operation simply excludes personnel from the accelerator room completely except for access through the main entrance in the control room or through the special key-operated door access in the mechanical equipment room in the low energy end of MP-6. The key access is especially important in the three-stage mode of operation because the terminal ion source is in use rather than the regular external ion source on the

machine. This means that the regular external ion source on MP-6 can be used as test bench for ion source development work necessary for the development of new kinds of ions to extend the capabilities of the research program. The main ion source laboratory is in the new building addition and is immediately adjacent to this access point into the low energy end of MP-6. Since the accelerators are operated in the three-stage mode between 50 and 75% of the time, this type of operation allows considerable utilization of the ion source area of MP-6.

---

#### 2.4

Target Room Perimeter Control - Each target room can be brought into the perimeter control system at the option of the operator. The main purpose of the perimeter control for a target room in use is to aid the operator in observing when a target room is being entered by the working physicist. Whenever perimeter control is violated (unauthorized entry into any potential radiation area) cups are inserted and a chime at the master display panel is sounded to alert the operator and the illuminated white light at the violated entry point goes out. Generally, if no radiation is produced in the Target Room, its perimeter control is not used. However, if excessive radiation is detected in any target room that has not been interlocked, the beam is stopped by Faraday cups in the Accelerator Room. Target Room perimeter control allows the operators to maintain an overall surveillance of the facility independent of the radiation control system, the idea being to keep all unofficial personnel out of any of the active research areas when they are in operation and potentially dangerous.

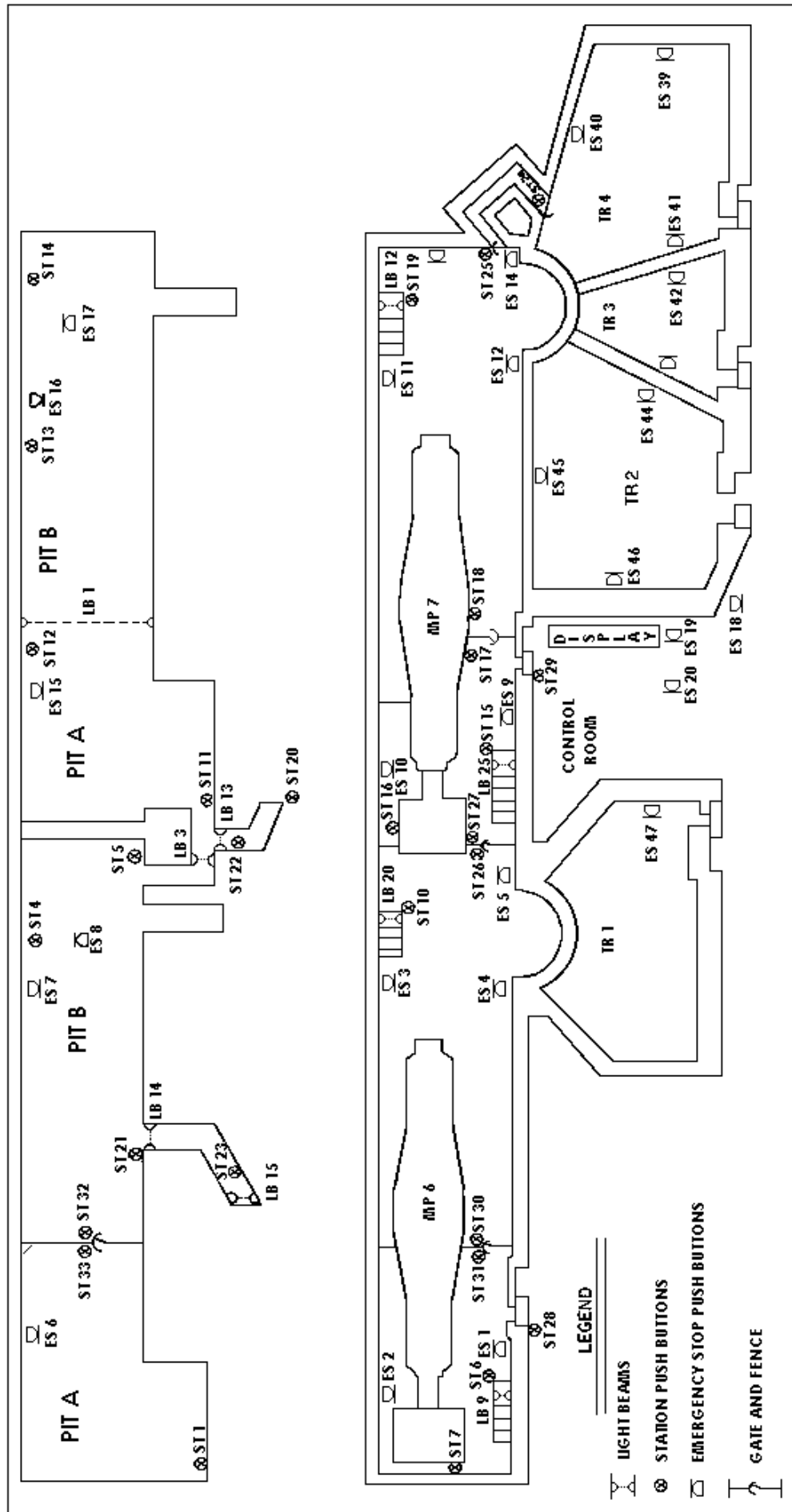


Figure 1

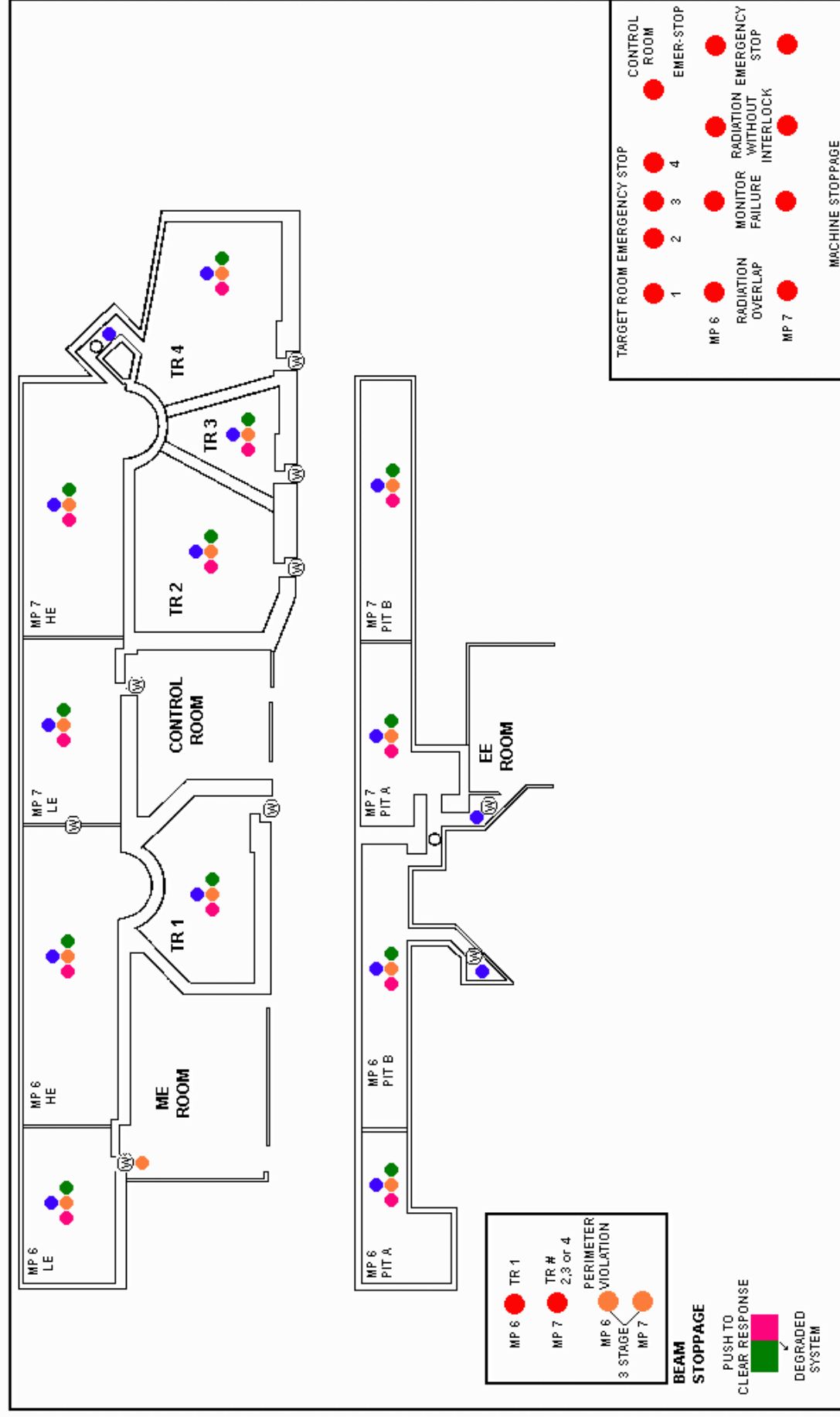


Figure 2